MAINTENANCE ENGINEERING PROCEDURE

UNION CARBIDE CORPORATION
NUCLEAR DIVISION
OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE 37830

Number MEP-101, Revision 1
Date July 7, 1977

REMOVAL AND REPLACEMENT OF K-33 CONVERTER

A. SCOPE

This procedure describes the removal and replacement of a "000" converter in K-33. The method includes converter change during the CIP/CUP covered by MEP-328.

C. QUALITY ASSURANCE

The performance and reliability of converters affects the integrity of the cascade. Quality workmanship in the following areas is necessary for proper installation of process converters:

1. Welding

Failure to produce good quality, leak-tight welds leads to considerable delay during leak acceptance tests. Faulty welds result in (1) release of process gas to the atmosphere, (2) inleakage into the process system, (3) formation of damaging corrosion product, and (4) cell off stream time to repair the weld.

2. Equipment Preparation and Inspection

Converter piping must be prepared and inspected as described in applicable drawings, specifications, and procedures. Failure to do so leads to schedule delays and failure to meet production commitments.

3. Rigging and Equipment Handling

Failure to properly rig a converter seriously endangers human life and may cause extensive damage and costly repair to cascade equipment. Personnel must have an approved license before operating a crane to handle converter (MEP-302, "Certification of Industrial Equipment Operators").

4. Cleanliness

The presence of foreign materials in the process piping can result in loss of converter coolers; consequently, this piping must be clean and free of oil, grease, dirt, weld slag, and loose scale.

PREPARED BY	APPROVED BY	REVIEWED FOR CLASSIFICATION
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5. Transporting

Comply with MEP-329, "Transporting of Compressors and "000" Converters Between K-1401, K-1420, and K-31 and K-33."

6. Quality Control Documentation

Complete form UCN-11968, "Process Converters - Field Data" for each (single) compressor change.

B. SAFETY ~~REQUIREMENTS~~

A Safety Work Permit (UNC-3694B), and Electrical Work Permit (UCN-513), and Burning Permit are required. The General Safe Practices listed in the ORGDP Safety and Health Standards apply, with particular emphasis on the following:

1. Check location of Safety Work Permit and the Electrical Work Permit against job location.

2. Burning: Wear respirator and protective clothing.

3. Grinding: Wear respirator, safety goggles, and protective face shield.

4. Lifting converter with overhead crane:

   a. Only qualified and licensed operator operates crane.

   b. Use siren during operation.

   c. Use proper lifting fixture (refer to K-SS 6.2 of the Safety and Health Standards).

   d. Adjust lifting fixture to assure that converter is level.

5. Keep floors free of cables, slings and other tripping hazards.

6. Wear hard hat, safety glasses and ear protection while on cell floor.

D. RESPONSIBILITIES

1. Field Maintenance, Routine Maintenance Personnel

   a. Confers with the Maintenance Engineering Services section representatives on input information used in the Computerized Equipment Information System (CEIS).

   b. Removes and installs converters in K-33.

   c. Contacts Cascade Operations for decontamination service, if required.

d. Fills out and forwards Process Converter - Field Data report to Maintenance Engineering.

e. Follows safety and industrial hygiene requirements.

f. Inspects the inside of converter and Freon and PG pipe openings to assure no foreign material is present.

g. Assures ET&I inspectors complete changeout inspection required.

2. Field Maintenance, PEM/PEU Personnel

a. Follows and completes applicable portions of PEM #902 (cell changeout check list).

b. Forwards completed cell changeout check list to general foreman, Cascade Maintenance.

c. Contacts Cascade Operations for cleaning and decontamination service, if required.

d. Follows safety and industrial hygiene requirements.

3. Cascade Operations Personnel

a. Purges the cell to a negative UF_6 concentration.

b. Furnishes Field Maintenance with Electrical and Safety Work Permits.

c. Contacts Health Physics for consultation, advice, and placement of signed and dated Radiation Contamination tags on converters scheduled for removal.

d. Contacts Chemical Operations group for cleaning and decontamination service, if required.

4. Chemical Operations Personnel

a. Cleans excessive product material from converter, if required.

b. Notifies Cascade Operations and Field Maintenance after cleaning operations.

5. Health Physics Personnel

a. Consults with Field Maintenance on safe working limits for their employees.

b. Places signed and dated Radiation Contamination tags on converter being removed from the cascade.

b. Equipment, Test, and Inspection (ET&I)

a. Monitors and inspects the internal cleanliness and quality of all welding performed.

b. Forwards welding inspection reports to Operations Engineering, Field Maintenance, and Maintenance Engineering.

E. GENERAL

1. K-33 converters are part of the cascade process system. This procedure covers the replacement of either a single converter or all converters in a complete cell changeout.

2. Since a converter removal requires taking a total cell from the cascade, it is necessary to complete the work as quickly as possible and yet maintain quality workmanship.

3. Pertinent information about the changeout (coolant leak, plugging, and damaged tube sheets) shall be documented on the Process Converters - Field Data cards. This form provides input data for the Computerized Equipment Information System (CEIS).

4. Follow an acceptable method of loading, unloading, and transporting a converter between Buildings K-1401, K-1420, and K-32 areas as described in MEP-329. This is extremely important for converter safety, care, protection, expediency, and compliance with ORGDP Health Physics and criticality requirements.

TOOLS, EQUIPMENT, AND MATERIAL REQUIRED FOR ONE CONVERTER

NO.	
1	6' ladder
2	8' ladder
1 roll	Green plastic tape
1 roll	Tie-wire (5# coil)
1	480 volt to 440 volt transformer/cart
4	Dust-type respirators
1	Vise-grip pliers
2	1/2" impact wrenches
1	Electric light/extension cord
2	Box sockets, 11/16" - 1/2" drive
2	Box sockets, 13/16" - 1/2" drive
1	Special pipe jack
1	H & M burner
4	Two-ton Come-Alongs
4	1/2" x 8' chokers
1	Aluminum work basket

2	1/2" x 4' chokers
2	Oxyacetylene torch outfits on carts
2	Fans
2	Arc welding machines on carts
3	Welders' outfits (brushes, hammers, masks, and gloves)
50 lbs.	Welding rod
2	5' pry bars
1	Disc grinder, electric (including 6 Prefax discs)
1	100' Extension cord, 4 outlets
25	2" C-clamps
1	Sheet metal cover (for "A" nozzle)
1	Sheet metal cover (for "B" nozzle)
1	Sheet metal cover (for "C" nozzle)
4	Mechanics' masks (full-face respirator protection)
3	Welders' masks (full-face respirator protection)
1 pr.	Converter lifting fixture
1	4-Way spreader (for handling cell covers)
3	Goggles or face shields (for grinding)
1	Vacuum cleaner
3 lbs.	Clean rags
3	Ladder platforms (for welders)
8	5/8" x 16" bolts (for expansion joints)
1	Plumb bob
2	12" chill rings (optional)
1	Shower cap (for "A" nozzle)
1	Shower cap (for "B" nozzle)
1	Shower cap (for "C" nozzle)

F. PROCEDURE

1. Preparation and Requirements for Single Converter Changeout

NOTE: Cascade Operations personnel purges the cell to a negative UF_6 concentration before permits are issued.

a. Obtain permits from Cascade Operations before starting a converter change.

b. Record the following information on the Process Converter - Field Data card (Fig. 1):

1) Building
2) Unit
3) Cell
4) Stage
5) Date

c. Remove cell top covers over work area, using a 4-way spreader and an overhead crane. (Fig. 2)

d. Remove bolts from side panel of cell adjacent to compressor nearest converter to be changed. (Fig. 3)

UCN-11968 (1 5-76)

PROCESS CONVERTERS - FIELD DATA

BLDG.	UNIT	CELL	STAGE	SUPERVISOR:	DATE:

REMOVAL		INSTALLATION	
SERIAL NO.	PROPERTY NO.	SERIAL NO.	PROPERTY NO.

REASON:

- ☐ Coolant Leak
- ☐ Plugging
- ☐ Damaged Tube Sheet
- ☐ Uprating Program
- ☐ Other _____

COMMENTS:

REASON:

- ☐ Replace Failed Converter
- ☐ CIP/CUP Program
- ☐ Plant Test Program
- ☐ Other _____

COMMENTS:

FIG. 1 PROCESS CONVERTERS - FIELD DATA CARD

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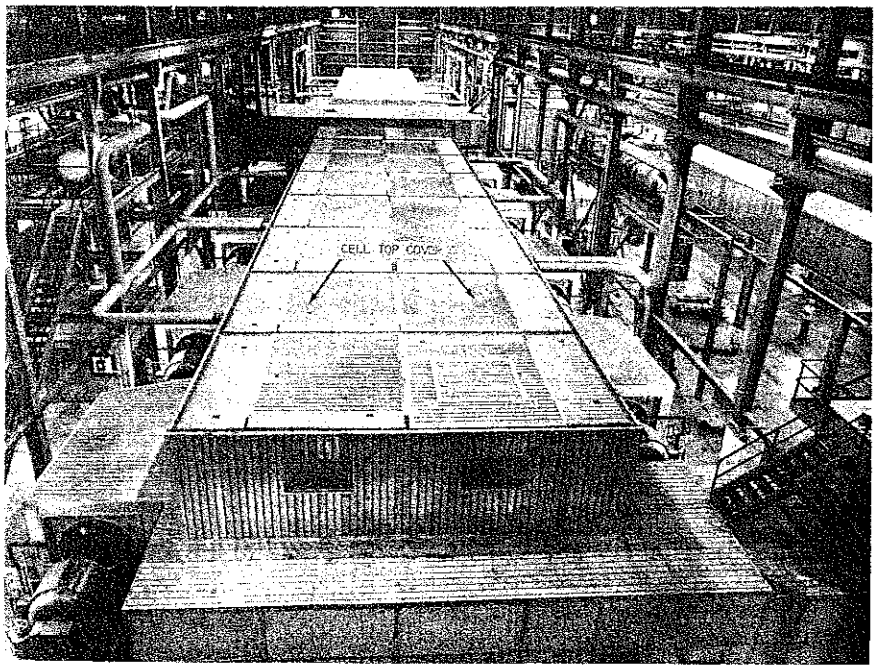

FIG. 2 TYPICAL CELL

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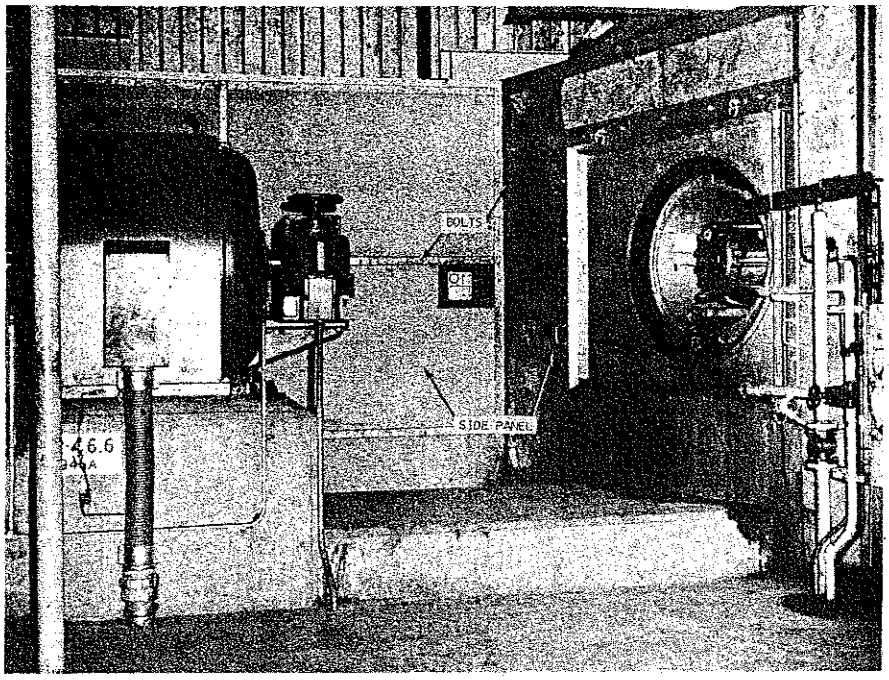

FIG. 3 ENTRANCE TO CONVERTER

e. Remove side panel and set aside.

f. Place two 42-inch fans on floor to blow air into the cell housing openings. This allows the smoke and hot air to move up through the top of the cell.

g. Connect arc welding machine to 480-volt transformer wagon; then connect wagon to a building outlet (200-amp service). Each welding machine must have enough cable for welder to move around freely without obstruction.

h. Use asbestos cloth and cover the expansion joint bellows, instruments, and instrument lines near the cutting and welding operations area. This keeps hot slag from burning through the thin metal joints and lines. (Fig. 4)

3. Removal of PG and Freon Lines

a. Install 5/8" x 16" bolts in the lugs on the PG line expansion joints as follows (Fig. 4):

1) 36" joint - use four bolts in the 8 lugs.
2) 42" joint - use three bolts in the 6 lugs.
3) Tighten bolts just enough to start to compress the expansion joint.

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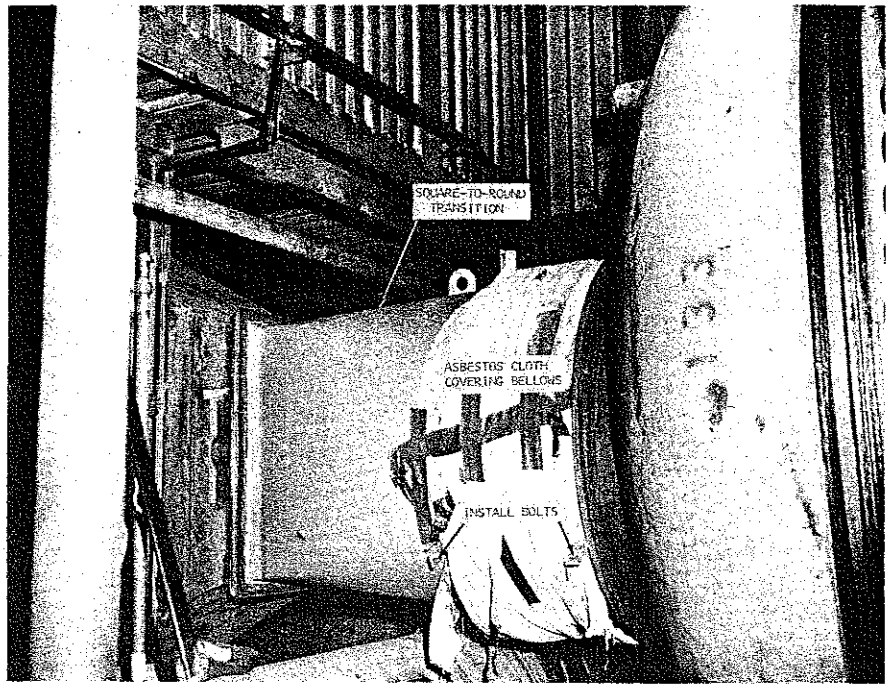

FIG. 4 PREPARATION FOR SCARFING

b. Position and install come-along or pipe stand jack to support cell piping while scarfing.

c. Connect choker around Freon inlet line as follows:

   1) Loop one end of a 1/2" x 8' choker around the Freon inlet line (bottom line on converter) at a location adjacent to the point of severance. Hook other end of choker to a come-along.
   2) Hook one end of 1/2" x 4' choker to the come-along and fasten other end to the nearest rigid support. This is necessary to pull the Freon line apart when lifting the converter.

d. Repeat step 3 for Freon outlet line (top line).

e. Separate converter from stage piping as follows:

   1) Scarf PG piping at each connecting flange joint nearest converter.

   2) Cut Freon piping at the weld which joins the stage line to the converter connection. Use H and M burner setup for an even, smooth cut except for TIA converters.

      CAUTION: Watch for movement of Freon line after burning. Stand clear of piping while making final cut.

f. To help break the burned cut, jack each severed Freon line clear with the attached come-along.

g. To allow clearance between PG line and converter flange, tighten the bolts in the lugs located around each expansion joint.

B. REMOVE CONVERTER

a. Using the overhead crane, attach converter lifting fixture to the converter.

NOTE: When attaching the lifting fixture to the lugs on the converter, insert the holding pin from the top side of the lug. Then insert the cotter pin into the holding pin from the top side of the holding pin.

b. Lift converter free of base. Keep the converter level by adjusting lift of double hoist crane before raising it clear of PG lines.(Fig.5)

NOTE: Adjust the lift of the double hoist crane to keep the converter level prior to its being raised clear of the PG lines.

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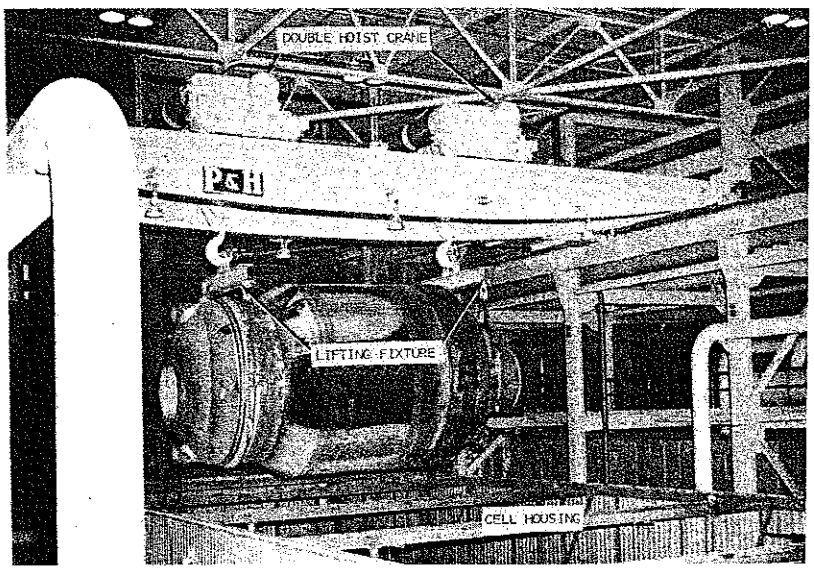

FIG. 5 CONVERTER REMOVAL

c. Install shower cap over each stage pipe opening immediately after converter removal.

d. Record the following information requested on the Process Converter-Field Data Card:

1) Serial and property number of the converter removed.

2) Reason for removal of the converter.

e. Install metal cover with masking tape over each flanged converter nozzle after converter is removed. Secure each cover in place with "C" clamps. (Fig. 6)

f. Place shower caps over the converter Freon inlet and outlet nozzles. If necessary, secure shower cap in place with masking tape.

NOTE: If converter is stored on K-33 cell floor, before transferring to retubing area use special wooden cell floor saddles. If converter components are reusable, treat with a buffer. (Fig. 6)

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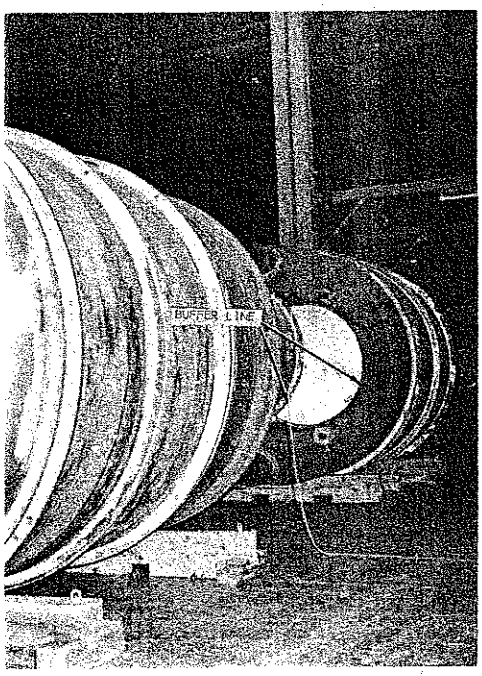

FIG. 6 BUFFER SETUP

g. When converter is removed directly from the building, move it to building hatch and lower onto a special Birmingham Lowboy Trailer. Transport it to the designated area (MEP-329) (Figs. 7, 8)

NOTE: Make sure converter is mounted securely on trailer.

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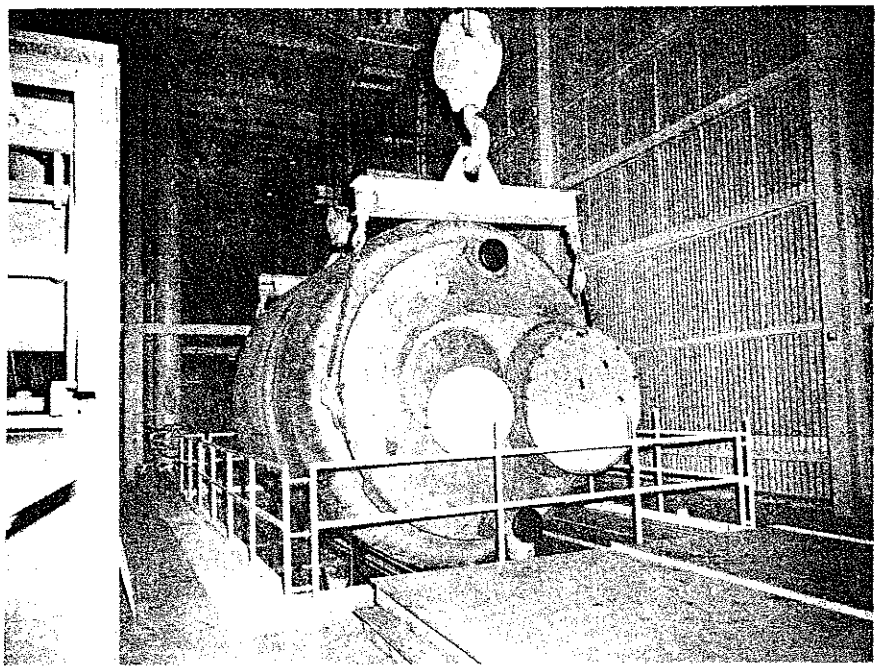

FIG. 7 BUILDING HATCH

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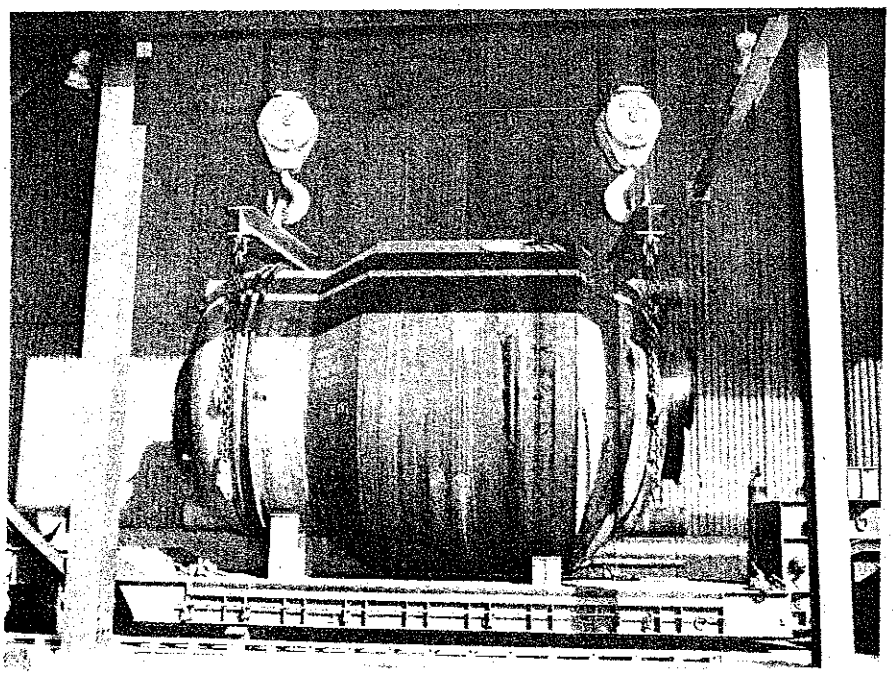

FIG. 8 CONVERTER TRANSPORT

4. Preparation of Stage for Converter Installation

a. Remove the metal cover from each PG pipe. (Chemical Operations personnel to vacuum interior, cleaning one pipe at a time.) Do not leave cover off any longer than necessary.

b. Recondition each flange on PG piping which connects to the converter:

1) Decontaminate all PG flanges (Chemical Operations personnel).

2) Prepare edge of flange for standard butt weld joint (UCN W-103).

3) Grind face of flange and remove approximately 1/2" of nickel plating from rim.

4) Vacuum the grinding dust from flange (Chemical Operations personnel).

CAUTION: Wear respirator and goggles during grinding and vacuuming operations.

c. After reconditioning PG flange, reclean and visually check the interior of each pipe to make certain it is free of foreign material. Keep each pipe opening covered until converter is moved to stage location.

d. Attach converter to overhead crane with special lifting fixture.

NOTE: It is important that the lifting fixture is attached properly. Installation alignment may be hampered even though the converter can be moved safely.

5. Converter Installation

a. Move converter to installation area.

b. Remove metal covers and shower caps from pipe openings.

c. Lower the converter into place on converter support frame and align converter stage piping as follows (Fig. 9):

1) Converter "A" and "B" outlet nozzles to compressor "A" and "B" inlet nozzles. If the "B" outlet nozzle does not align, roll converter to its proper alignment position by moving overhead crane either north or south.

CAUTION: Use extreme care while rolling the converter.

2) Converter "A" inlet nozzle to compressor spool piece.

3) After the converter "A" inlet, "A" outlet and "B" outlet nozzles are properly aligned, hold the alignment by using shims, if necessary.

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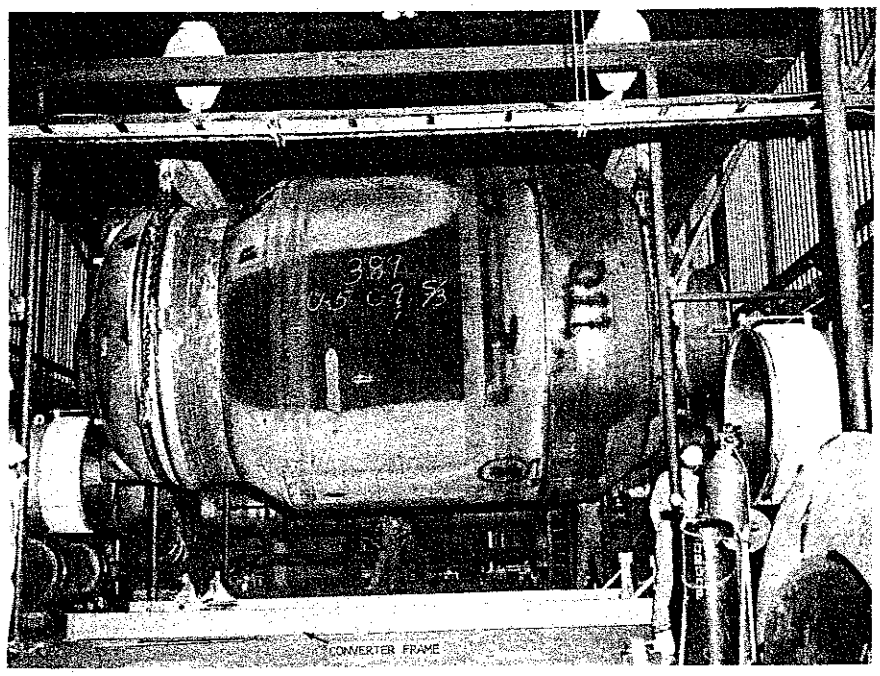

FIG. 9 CONVERTER INSTALLATION

4) Position the shims either under the converter support base at the inlet side or under the bearing assembly at the outlet side For shim installation details refer to Drawing D-S-77603-C5 and E-S-77603-C3 (Fig. 10).

d. Loosen 5/8" x 16" bolts from spool expansion joints.

e. Remove converter lifting fixture.

f. Place "C" clamps in the order listed on each flanged joint to hold it in alignment to the stage PG piping during welding operation.

1) Clamp nozzle "A".

2) Clamp nozzle "C".

3) Clamp nozzle "B".

IMPORTANT: Do not use "C" clamps to force flange into position.

g. Use chill rings to align Freon inlet and outlet to stage Freon line.

b. Welding

a. Prepare each flange and each Freon joint for a standard butt weld (UCN W-103).

b. Tack weld each joint securely and remove "C" clamps.

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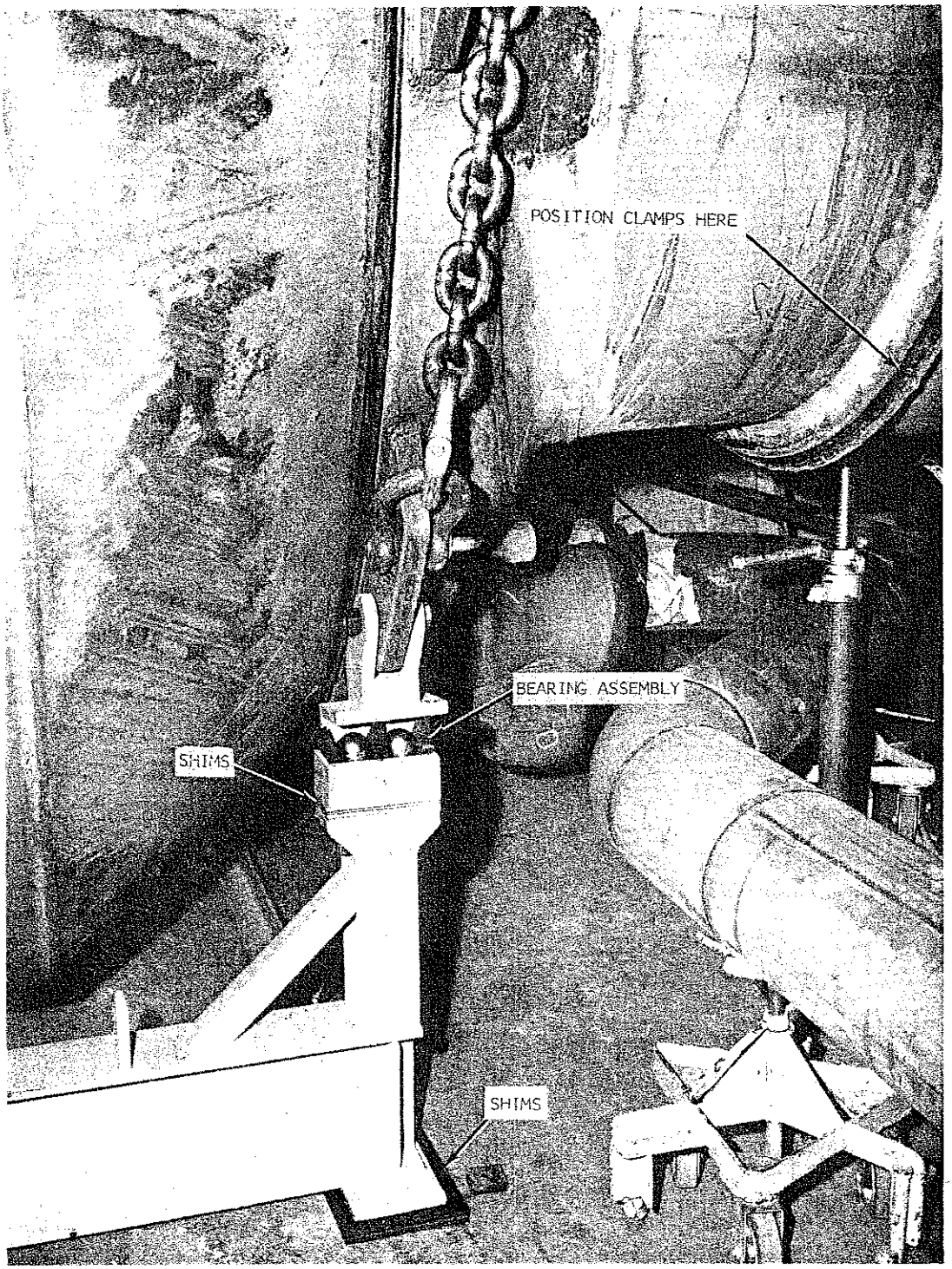

FIG. 10 ALIGNMENT

c. Metallic arc weld each joint. Use ASTM 7016 or 7018 rod per UCN W-103. As an alternate, short-arc weld with E-705-4 wire per UCN W-123. Complete Freon line welding as soon as possible. (Fig. 11)

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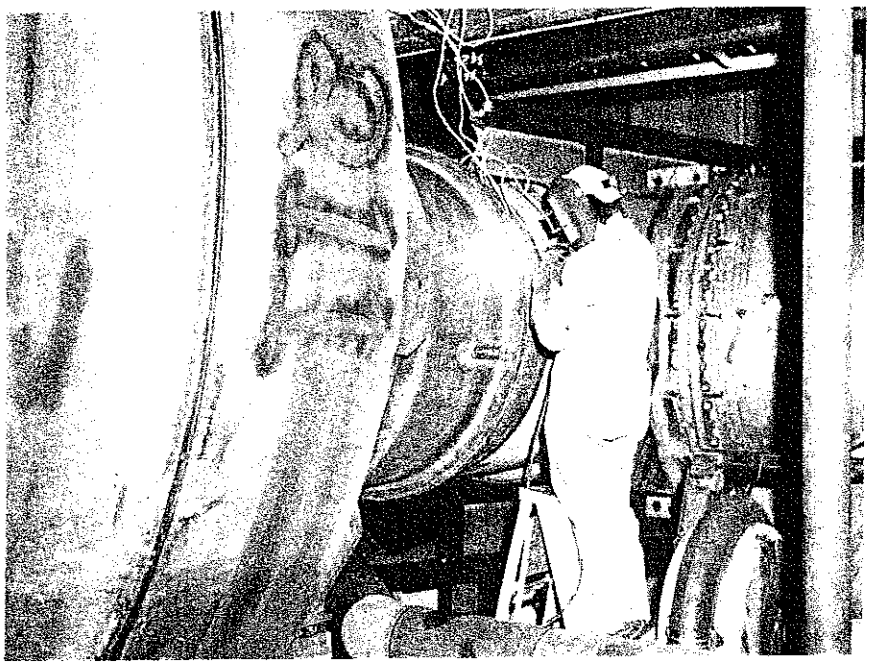

FIG. 11 WELDING

d. Remove slag from weld with a wire brush to assure good leak test.

e. Each welder stencils each joint.

7. Miscellaneous

a. Record the converter serial and property numbers on the Process Converter - Field Data card.

b. Release coolant system Safety Work Permit to Operations.

c. Remove tools, equipment, and material, except one arc welding machine and one oxyacetylene outfit.

d. Notify Cascade Operations personnel that converter installation is complete. Request Operations to pressure test each weld for leaks.

e. Complete and release remaining work permits.

f. Repair leaks as requested by Operations Division personnel.

g. When Operations notify that stage is ready for operation, disconnect and remove the following:

   1) Two fans.

   2) Remaining equipment and any foreign material, tools, or fixtures from the cell.

h. Replace the two cell covers.

i. Clean up the area in and around the cell and replace bolted doors.

j. Supervisor-in-charge signs the Process Converter - Field Data card and forwards card to Maintenance Engineering.

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